

FCC ID: T8GP104 IC ID: 6434A-P104

EMI - TEST REPORT

- FCC Part 15.247, RSS210 -

**Test Report No. :** T36587-00-01KJ

27. February 2013

Date of issue

Type / Model Name : P104 Headphone**Product Description** : Wireless Headphone with KLEER-RF-technology**Applicant** : HARMAN BECKER Automotive Systems GmbH

Address : Becker-Görling-Str. 16

76307 KARLSBAD, GERMANY

Manufacturer : HARMAN BECKER Automotive Systems GmbH

Address : Becker-Görling-Str. 16

76307 KARLSBAD, GERMANY

Licence holder : HARMAN BECKER Automotive Systems GmbH

Address : Becker-Görling-Str. 16

76307 KARLSBAD, GERMANY

Test Result according to the
standards listed in clause 1 test
standards:**POSITIVE**

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test results
without the written permission of the test laboratory.

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1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15, Subpart A - General (September, 2012)

Part 15, Subpart A, Section 15.31	Measurement standards
Part 15, Subpart A, Section 15.33	Frequency range of radiated measurements
Part 15, Subpart A, Section 15.35	Measurement detector functions and bandwidths

FCC Rules and Regulations Part 15 Subpart B - Unintentional Radiators (September, 2012)

Part 15, Subpart B, Section 15.107	AC Line conducted emission <input type="checkbox"/> Class A device <input checked="" type="checkbox"/> Class B device
Part 15, Subpart B, Section 15.109	Radiated emission, general requirements

FCC Rules and Regulations Part 15, Subpart C - Intentional Radiators (September, 2010)

Part 15, Subpart C, Section 15.203	Antenna requirement
Part 15, Subpart C, Section 15.204	External radio frequency power amplifiers and antenna modifications
Part 15, Subpart C, Section 15.205	Restricted bands of operation
Part 15, Subpart C, Section 15.207	Conducted limits
Part 15, Subpart C, Section 15.209	Radiated emission limits, general requirements
Part 15, Subpart C, Section 15.247	Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz and 5725 - 5850 MHz

FCC Rules and Regulations Part 1, Subpart I - Procedures Implementing the National Environmental Policy Act of 1969

Part 1, Subpart I, Section 1.1310	Radiofrequency radiation exposure limits
Part 1, Subpart 2, Section 2.1093	Radiofrequency radiation exposure evaluation: portable device

OET Bulletin 65, 65A, 65B, 65C Edition 97-01, August 1997 – Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields.

ANSI C63.4: 2009	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
ANSI C63.10: 2009	Testing Unlicensed Wireless Devices
ANSI C95.1: 2005	IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz
CISPR 16-4-2: 2003	Uncertainty in EMC measurement
CISPR 22: 2005 EN 55022: 2006	Information technology equipment
KDB 558074 D01 v02	Guidance for performing compliance measurements on DTS operating under Section 15.247, 2012-10-4.
KDB 447498 D01 v05	General RF Exposure Guidance

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2 SUMMARY

2.1 Test result summary

The device using digital modulation:

Operating in the 2400 MHz – 2483.5 MHz:

FCC Rule Part	RSS Rule Part	Description	Result
15.207(a)	RSS Gen, 7.2.4.	AC power line conducted emissions	not applicable
15.247(a)(2)	RSS210, A8.2(a)	-6 dB Emission bandwidth	passed
	RSS-Gen, 4.6.1	99 % Occupied bandwidth	passed
15.247(b)(3)	RSS-210, A8.4(4)	Maximum peak conducted output power	passed
15.247(d)	RSS-210, A8.5	Spurious emissions conducted	passed
15.247(d)	RSS-210, A8.5	Band edge compliance	passed
15.247(d) 15.205(a)	RSS-Gen, 7.2.2	Radiated emissions in restricted bands	passed
15.247(e)	RSS-210, A8.2(b)	Power spectral density	passed
15.247(i)	RSS 102, 2.5.2	SAR test exclusion considerations	passed
15.247(b)(4)	RSS-Gen, 7.1.2	Antenna requirement	passed
15.107	RSS Gen, 7.2.4.	AC power line conducted emissions	not applicable
15.109(a)	RSS-Gen, 6.1	Receiver spurious emissions, radiated	passed
	RSS-Gen, 7.2.6	Transmitter frequency stability	not applicable
OET Bulletin 65	RSS102, 3.2	Co-location, Co-transmission	not applicable

The mentioned RSS Rule Parts in the above table are related to:

RSS Gen, Issue 3, December 2010

RSS 210, Issue 8, December 2010

RSS 102, Issue 4, March 2010

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2.2 General remarks

The EUT is wireless stereo headphones, featuring Kleer technology for lossless digital audio transmission and operates in 2.4 GHz ISM band. The channel switch provides the facility to select between two different sources.

The EUT divides the spectrum into 16 channels spaced at 5 MHz. The EUT can operate on any of these channels and will automatically switch to another channel when the current channel is experiencing poor performance due to interference or fading. The radio operates using time domain duplex communications, such that communications from audio source to audio sink are on the same channel as communications from audio sink to audio source.

There are two internally chip antenna (Type: FR05-S1-N-0-102, peak gain = 1.5 dBi) on a PCB-Board.

Channel	Frequency
0	2403 MHz
1	2408 MHz
2	2413 MHz
3	2418 MHz
4	2423 MHz
5	2428 MHz
6	2433 MHz
7	2438 MHz

Channel	Frequency
8	2443 MHz
9	2448 MHz
10	2453 MHz
11	2458 MHz
12	2463 MHz
13	2468 MHz
14	2473 MHz
15	2478 MHz

The test software for the EUT provides only full power setting and the test mode TX continuous mode, modulated. The EUT was set with test modulation to transmit data during the tests with a duty cycle (X) of assumed X = 1.

Following channels were selected for the final test:

Standard	Available Channel	Tested Channel	Modulation	Modulation Type	Data Rate (Mbps)
2.4 GHz ISM band	0 to 15	0, 7, 15	digital	MSK	2.37

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2.3 Final assessment

The equipment under test fulfils the EMI requirements cited in clause 1 test standards.

Date of receipt of test sample : acc. to storage records

Testing commenced on : 30. January 2013

Testing concluded on : 27. February 2013

Checked by:

Tested by:

Klaus Gegenfurtner
Dipl. Ing.(FH)
Manager: Radio Group

Josef Knab
Radio Senior Expert

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3 EQUIPMENT UNDER TEST

3.1 Photo documentation of the EUT – Detailed photos see attachment A

3.2 Power supply system utilised

Power supply voltage, V_{nom} : 3.0 V DC (battery powered)

3.3 Short description of the equipment under test (EUT)

PRODUCT	Wireless Headphone
MODEL NO.	P104 headphone
TYPE OF EQUIPMENT	ISM 2.4 GHz band
MODULATION TYPE	digital
MODULATION TECHNOLOGY	MSK
TRANSFER RATE	2.37 Mbps
FREQUENCY RANGE	2400 – 2483.5 MHz
NUMBER OF CHANNEL	Max. 16
RATED RF OUTPUT POWER	4.0 mW
CONDUCTED RF OUTPUT POWER	2.6 mW
ANTENNA TYPE	FR05-S1-N-0-102, Chip-Antenna
ANTENNA STRUCTURE GAIN	1.5 dBi

Number of tested samples: 1
 Hardware ID (Serial number): UID: 00:38:52:D4:00:00
 Firmware ID: KLR1010.1.1.26

EUT operation mode:

The equipment under test was operated during the measurement under the following conditions:

- continuous TX mode (MSK)

- continuous TX mode (CW)

- continuous RX mode

EUT configuration:

(The CDF filled by the applicant can be viewed at the test laboratory.)

The following peripheral devices and interface cables were connected during the measurements:

- Laptop - Fujitsu Siemens	Model : Lifebook
- Test software – Kleer Development Tool	Model : IC: KLR2010-2.4
- USB-Adaptor Board	Model : 19 E R 1538.934

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4 TEST ENVIRONMENT

4.1 Address of the test laboratory

**mikes-testingpartners gmbh
Ohmstrasse 2-4
94342 STRASSKIRCHEN
GERMANY**

4.2 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature: 15-35 °C

Humidity: 30-60 %

Atmospheric pressure: 86-106 kPa

4.3 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16-4-2 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements“ and is documented in the quality system acc. to DIN EN ISO/IEC 17025. For all measurements shown in this report, the measurement uncertainty of the test laboratory, mikes-testingpartners gmbh, is below the measurement uncertainty as defined by CISPR. Therefore, no special measures must be taken into consideration with regard to the limits according to CISPR. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

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4.4 Measurement protocol for FCC and IC

4.4.1 General information

4.4.1.1 Test methodology

Conducted and radiated disturbance testing is performed according to the procedures set out by the International Special Committee on Radio Interference (CISPR) Publication 22, European Standard EN 55022 as shown under section 1 of this report.

The Open Area test site is a listed Open Site under the Canadian Test-Sites File-No:

IC 3009A

In compliance with RSS 210 testing for RSS compliance may be achieved by following the procedures set out in ANSI C63.4 and applying the CISPR 22 limits.

4.4.1.2 Justification

The equipment under test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral using the appropriate impedance characteristic or left unterminated. Where appropriate, cables are manually manipulated with respect to each other thus obtaining maximum disturbances from the unit.

4.4.1.3 Details of test procedures

The test methods used comply with CISPR Publication 22, EN 55022 - "Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement" and with ANSI C63.4 - "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz". In compliance with 47 CFR Part 15 Subpart A, Section 15.38 testing for FCC compliance may be achieved by following the procedures set out in ANSI C63.4 and applying the CISPR 22 limits.

4.4.1.4 Conducted emission

The final level, expressed in dB μ V, is arrived at by taking the reading directly from the EMI receiver. This level is compared directly to the FCC limit or to the CISPR limit.

To convert between dB μ V and μ V, the following conversion formula apply:

$$\begin{aligned} \text{dB}\mu\text{V} &= 20 \cdot \log(\mu\text{V}) \\ \mu\text{V} &= 10^{(\text{dB}\mu\text{V}/20)} \end{aligned}$$

Conducted emissions on the 50 Hz and/or 60 Hz power interface of the EUT are measured in the frequency range of 150 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection and a Line Impedance Stabilization Network (LISN) with 50 Ω / 50 μ H (CISPR 16) characteristics. Table top equipment is placed on a non-conducting table 80 centimetres above the floor and is positioned 40 centimetres from the vertical ground plane (wall) of the screen room. If the minimum limit margin of a peak mode measurement appears to be less than 20 dB, the emissions are remeasured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

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4.4.1.5 Radiated emission (electrical field 30 MHz - 1 GHz)

Spurious emission from the EUT is measured in the frequency range of 30 MHz to 1000 MHz using a tuned receiver and appropriate broadband linearly polarised antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection. Table top equipment is placed on a 1.0 X 1.5 m non-conducting table 80 centimetres above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. The setup of the equipment under test is established in accordance with ANSI C63.4. The interface cables that are closer than 40 cm to the ground plane are bundled in the center in a serpentine fashion so that they are at least 40 cm from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screened room located outside the test area. The antenna is positioned 3, 10 or 30 m horizontally from the EUT and is repeated vertically. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 m and the EUT is rotated 360 degrees.

The final level in dB μ V/m is calculated by add on the reading value from the EMI receiver (level dB μ V) the correction factor. The FCC or CISPR limit is subtracted from this result in order to provide the limit margin listed in the measurement protocol.

The resolution bandwidth setting:

30 MHz – 1000 MHz: RBW: 120 kHz

Example:

Frequency (MHz)	Reading level (dB μ V)	+	Correction Factor (dB/m)	=	Level (dB μ V/m)	-	CISPR Limit (dB μ V/m)	=	Delta (dB)
719.0	75.0	+	32.6	=	107.6	-	110.0	=	-2.4

4.4.2 Radiated emission (electrical field 1 GHz - 40 GHz)

4.4.2.1 Description of measurement

Radiated emissions from the EUT are measured in the frequency range 1 GHz up to the maximum frequency as specified in 47 CFR Part 15, Subpart A, Section 15.33, using a spectrum analyser and appropriate linearly polarized antennas. Table top equipment is placed on a 1.0 X 1.5 metre non-conducting table 80 centimetres above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. The setup of the equipment under test is following set out in ANSI C63.4. The interface cables that are closer than 40 centimetres to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 centimetres from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screened room located outside the test area. Measurements are made in both the horizontal and vertical polarization planes in a fully anechoic room using a spectrum analyser set to max peak detector function and a resolution 1 MHz and video bandwidth 3 MHz for peak and 10 Hz for average measurement. The conditions determined as worst case will then be used for the final measurements. When the EUT is larger than the beam width of the measuring antenna it will be moved over the surface for the four sides of the equipment. Where appropriate, the test distance may be reduced in order to detect emissions under better uncertainty and are calculated at the specified test distance.

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5 TEST CONDITIONS AND RESULTS

5.1 Conducted emissions

For test instruments and accessories used see section 6 Part A 4.

5.1.1 Description of the test location

Test location: NONE

Remarks: Not applicable. The device is battery powered

mikes

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5.2 Emission bandwidth

For test instruments and accessories used see section 6 Part MB.

5.2.1 Description of the test location

Test location: Shielded Room S4

5.2.2 Photo documentation of the test set-up



5.2.3 Applicable standard

According to FCC Part 15, Section 15.247(a)(2):

Systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 – 2483.5 MHz and 5725 – 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

5.2.4 Description of Measurement

The bandwidth was measured at an amplitude level reduced from the reference level of a modulated channel by a ratio of -6 dB. The reference level is the level of the highest signal amplitude observed at the transmitter at either the fundamental frequency or the first order modulation products in all typical modes of operation, including the unmodulated carrier, even if atypical. An alternative is to use the bandwidth measurement of the analyser. The cable loss of 1.3 dB @ 2.45 GHz is taken into account.

Spectrum analyser settings:

RBW: 100 kHz, VBW: 300 kHz, Detector: Max peak, Trace Mode: Max hold, Sweep time: Auto

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The table below shows the settings according to ANSI C63.4:

Fundamental frequency	Minimum resolution bandwidth
9 kHz to 30 MHz	1 kHz
30 to 1000 MHz	10 kHz
1000 MHz to 40 GHz	100 kHz

5.2.5 Test result

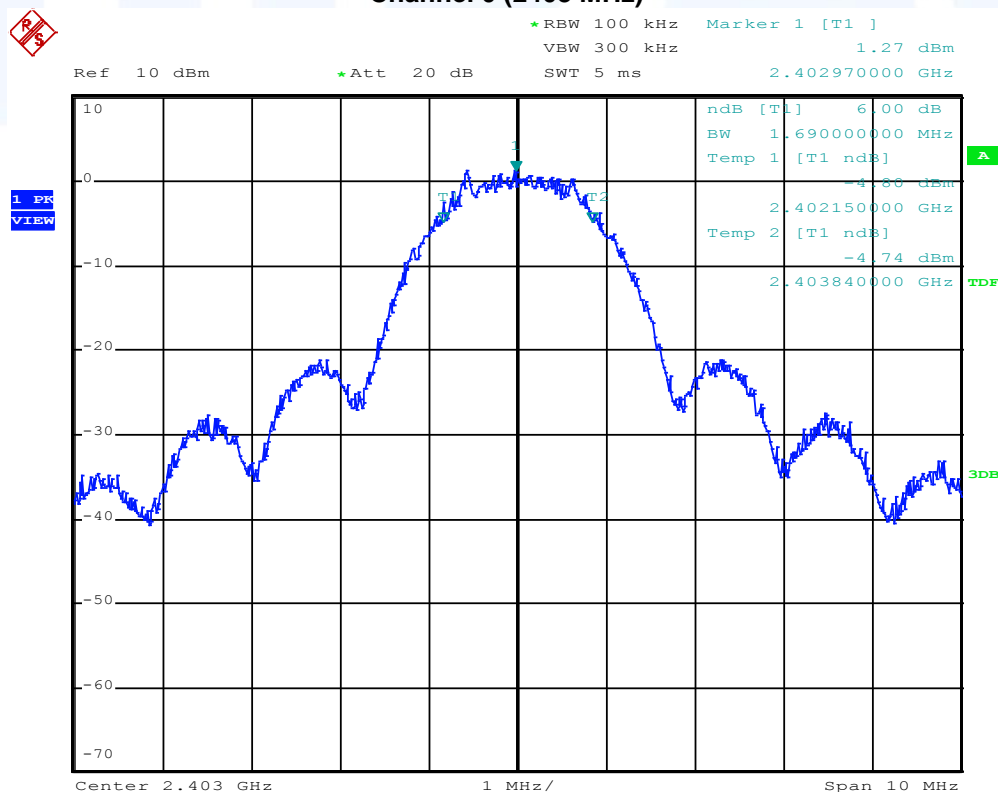
Channel number	Fundamental frequency (MHz)	6 dB Bandwidth (MHz)	Minimum limit (MHz)
0	2403	1.69	0.5
7	2438	1.72	0.5
15	2478	1.81	0.5

The requirements are **FULFILLED**.

Remarks: For detailed test results please refer to following test protocols.

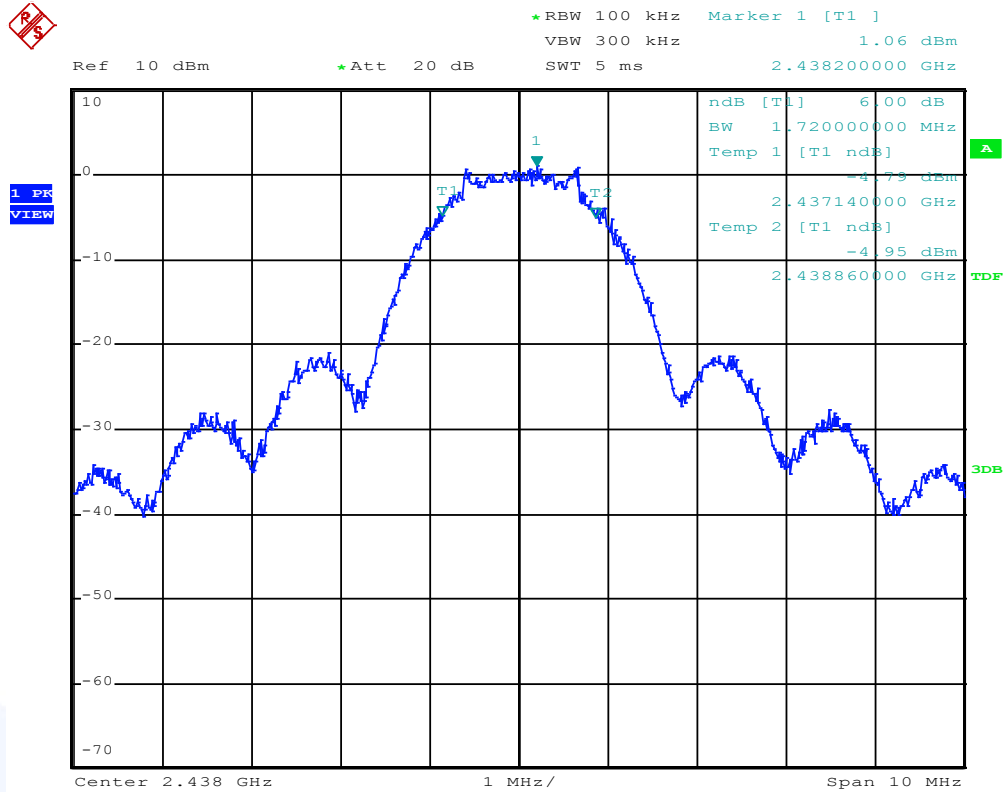
5.2.6 Test protocols

Channel 0 (2403 MHz)

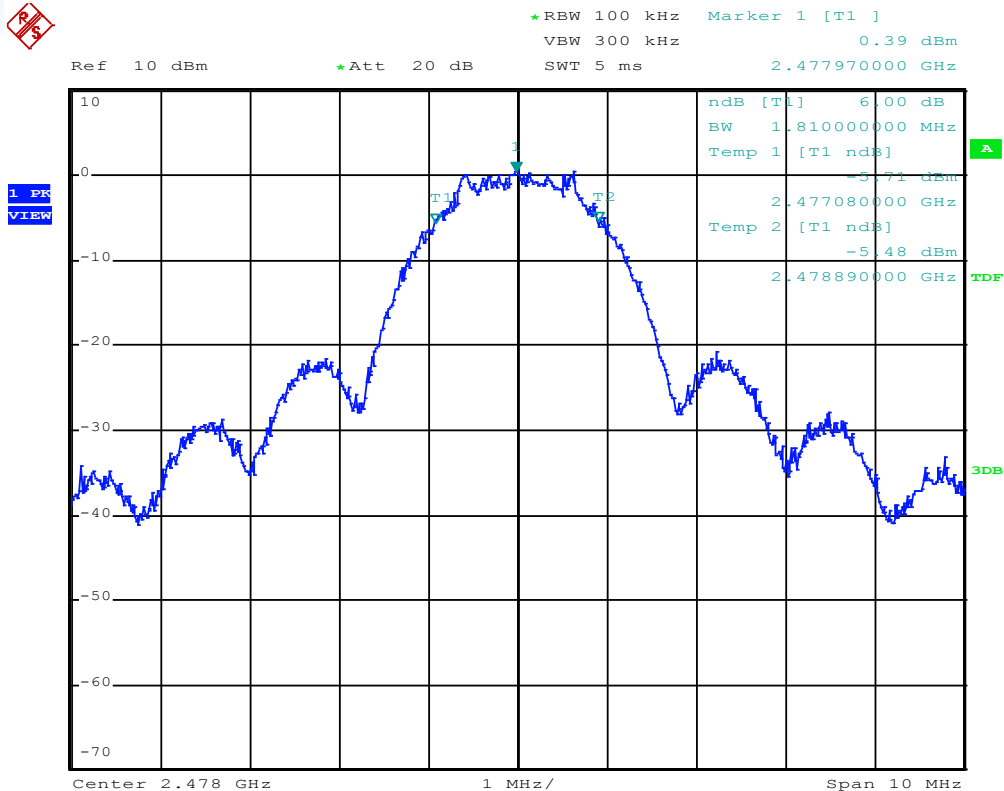


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Channel 7 (2438 MHz)



Channel 15 (2478 MHz)



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5.3 Occupied bandwidth

For test instruments and accessories used see section 6 Part MB.

5.3.1 Description of the test location

Test location: Shielded Room S4

5.3.2 Photo documentation of the test set-up



5.3.1 Applicable standard

According to RSS-Gen, 4.6.1:

When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99 % emission bandwidth, as calculated or measured.

5.3.2 Description of Measurement

The bandwidth was measured with the function "bandwidth measurement" of the spectrum analyser. The EUT is connected via suitable attenuator at the spectrum analyser. The measurement is repeated for every different modulation standard of the EUT and recorded. The cable loss of 1.3 dB @ 2.45 GHz is taken into account.

Spectrum analyser settings:

RBW: 100 kHz, VBW: 300 kHz, Detector: Max peak, Trace Mode: Max hold, Sweep time: Auto

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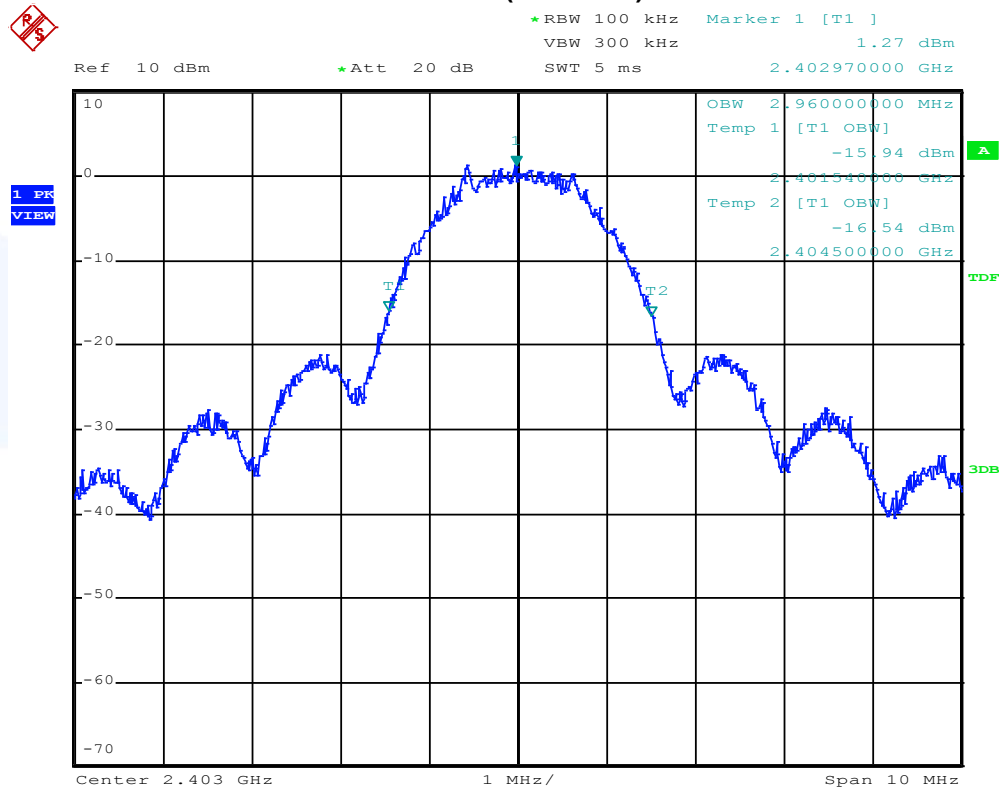
5.3.3 Test result

Channel number	Fundamental frequency (MHz)	99 % Bandwidth (MHz)
0	2403	2.96
7	2438	2.96
15	2478	2.95

Remarks: For detailed test result please refer to following test protocols. The RSS Gen defines no limit for the occupied bandwidth!

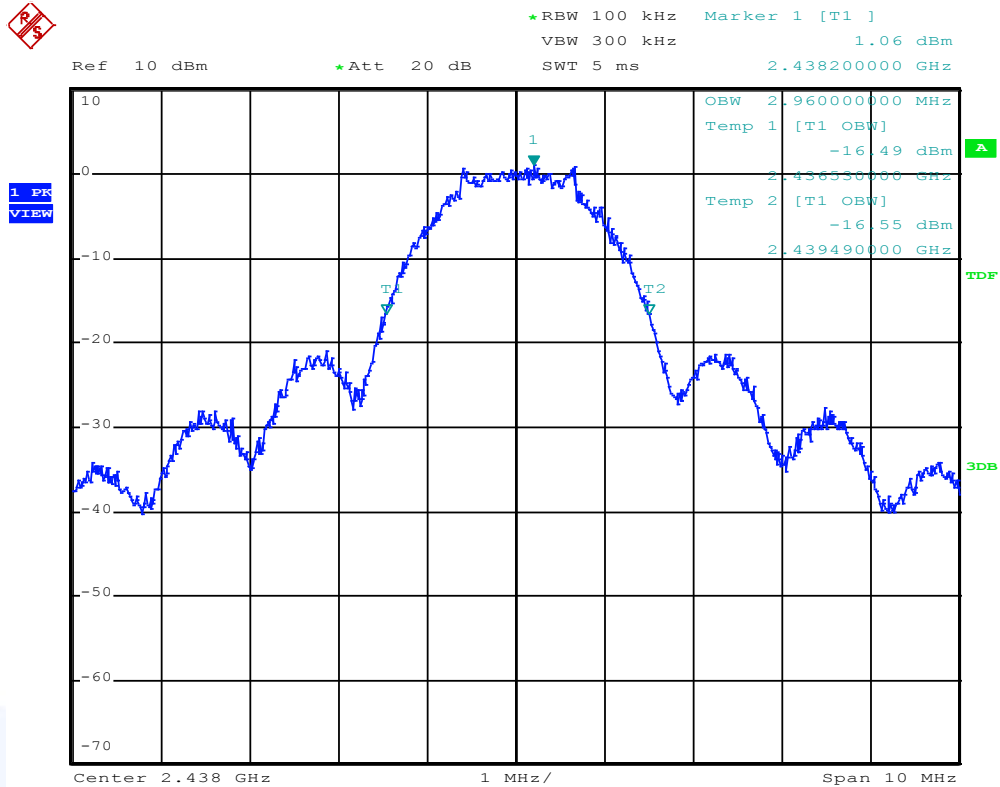
5.3.4 Test protocols

Channel 0 (2403 MHz)

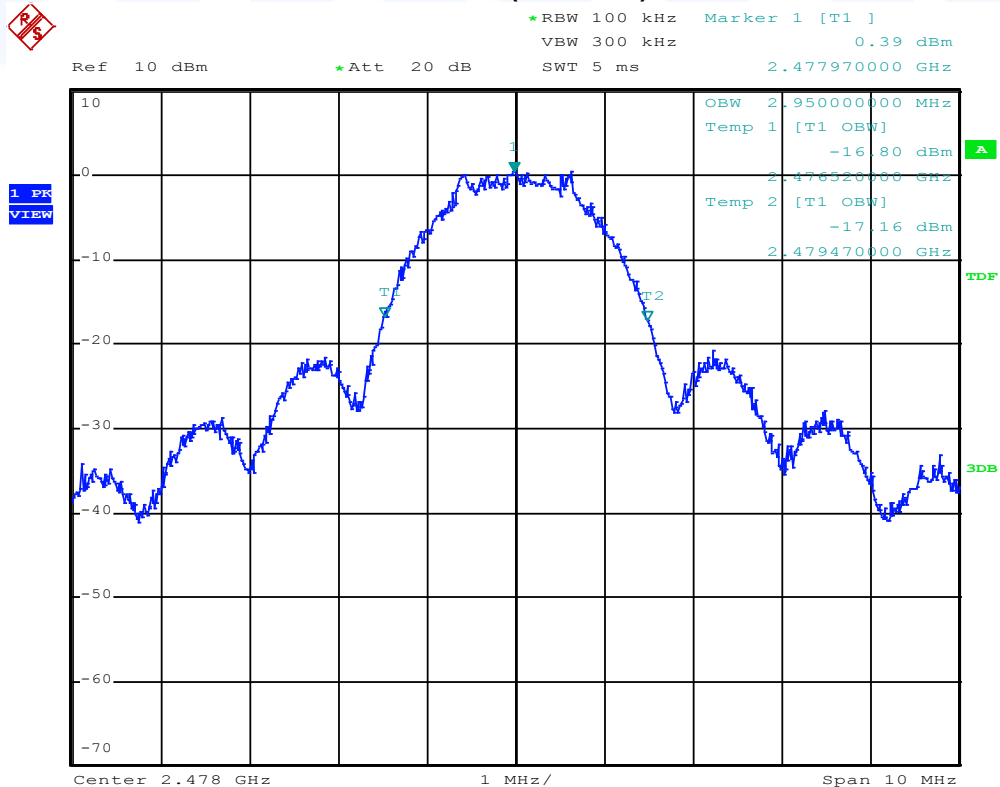


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Channel 7 (2438 MHz)



Channel 15 (2478 MHz)



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5.4 Maximum peak conducted output power

For test instruments and accessories used see section 6 Part CPC 3.

5.4.1 Description of the test location

Test location: Shielded Room S4

5.4.2 Photo documentation of the test set-up



5.4.3 Applicable standard

According to FCC Part 15, Section 15.247(b)(3):

For systems using digital modulation in the 2400-2483.5 MHz and 5725 – 5850 MHz bands, the maximum peak output power of the transmitter shall not exceed 1 Watt. The limit is based on transmitting antennas of directional gain that do not exceed 6 dBi.

5.4.4 Description of Measurement

The output power is measured using the spectrum analyzer method according KDB 558074, clause 8.1 option 1. The EUT is set while measuring in TX continuous mode with a duty cycle, $x = 1$. The cable loss of 1.3 dB @ 2.45 GHz is taken into account.

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5.4.5 Test result

Channel	Frequency (MHz)	Power settings (ΔdB)	Corr. peak power (dBm)	Peak power limit (dBm)	Delta (dB)
0	2403	-	4.1 (2.6 mW)	30	25.9
7	2438	-	3.9 (2.5 mW)	30	26.1
15	2478	-	3.5 (2.2 mW)	30	36.5

Peak Power Limit according to FCC Part 15, Section 15.247(b)(3):

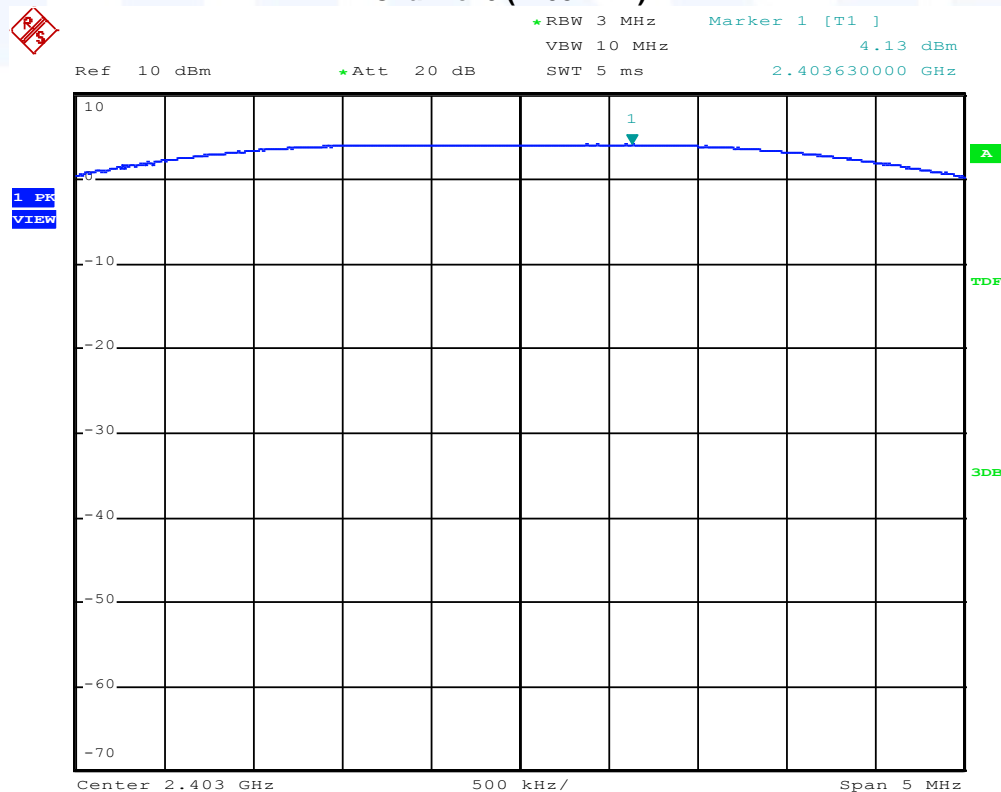
Frequency (MHz)	Peak Power Limit	
	(dBm)	(Watt)
902-928	30	1.0
2400-2483.5	30	1.0
5725-5850	30	1.0

The requirements are **FULFILLED**.

Remarks:

5.4.6 Test protocols

Channel 0 (2403 MHz)



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Channel 7 (2438 MHz)

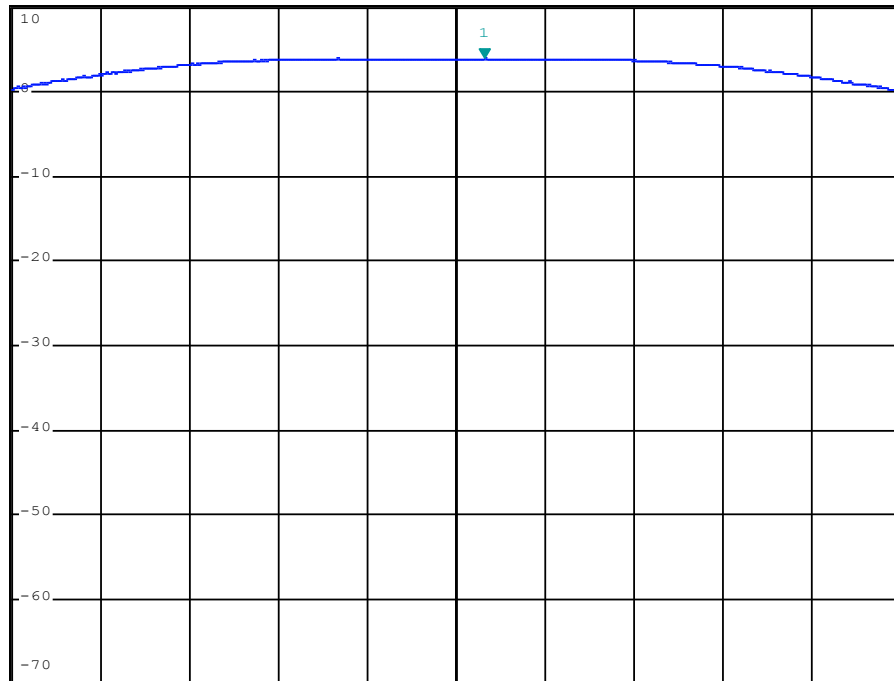


*RBW 3 MHz Marker 1 [T1]
VBW 10 MHz 3.91 dBm
SWT 5 ms 2.438155000 GHz

Ref 10 dBm

*Att 20 dB

1 PK
VIEW



Center 2.438 GHz

500 kHz/

Span 5 MHz

Channel 15 (2478 MHz)

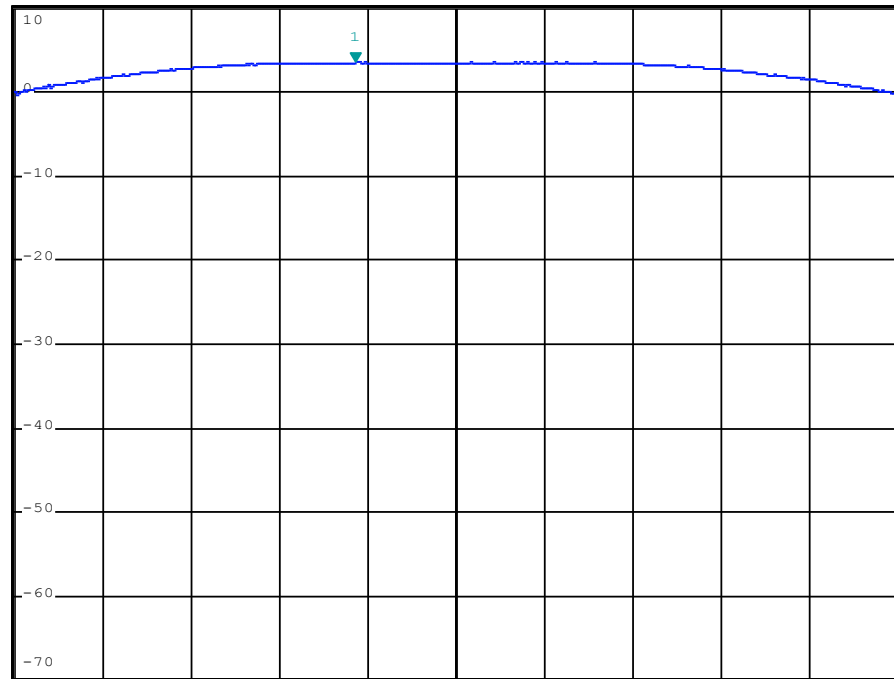


*RBW 3 MHz Marker 1 [T1]
VBW 10 MHz 3.54 dBm
SWT 5 ms 2.477430000 GHz

Ref 10 dBm

*Att 20 dB

1 PK
VIEW



Center 2.478 GHz

500 kHz/

Span 5 MHz

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5.5 Spurious emissions conducted

For test instruments and accessories used see section 6 Part SEC 2 and SEC 3.

5.5.1 Description of the test location

Test location: Shielded Room S4

5.5.2 Photo documentation of the test set-up



5.5.3 Applicable standard

According to FCC Part 15, Section 15.247(d):

In any 100 kHz bandwidth outside the frequency bands 2400 – 2483.50 MHz and 5725 – 5850 MHz, the digitally modulated radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or an radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limit specified in Section 15.209(a) (see Section 15.205(c)).

5.5.4 Description of measurement

The spurious emissions are measured conducted using a spectrum analyser in a test setup following the procedures set out in KDB 558074 for DTS. The transmitter is set to the lowest operating frequency (CH0), the middle (CH7) and to the highest operating frequency (CH15). The frequency spectrum outside from the operating frequency range (2400 - 2483.5 MHz) is scanned for emissions that exceed the defined limit. The measurement is performed at normal test conditions in modulated TX continuous mode. The cable loss of the complete frequency range is taken into account.

Spectrum analyser search setting:

RBW: 100 kHz, VBW: 300 kHz, Detector: Max peak, Trace Mode: Max hold, Sweep time: Auto

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5.5.5 Test result

Highest level of the desired power:

1.0 dBm (CH0)

CH0 (2403 MHz)			CH7 (2438 MHz)			CH15 (2478 MHz)		
f (MHz)	Level PK (dBm)	Limit (dBm)	f (MHz)	Level PK (dBm)	Limit (dBm)	f (MHz)	Level PK (dBm)	Limit (dBm)
2184.3	-53.6	-19.0	2217.3	-52.3	-19.8	2253.3	-51.6	-19.7
2622.1	-53.0	-19.0	2661.1	-53.1	-19.8	2706.1	-55.2	-19.7
4800.0	-46.9	-19.0	2883.0	-54.9	-19.8	2931.0	-53.1	-19.7
7200.0	-52.9	-19.0	4872.0	-46.5	-19.8	4956.0	-44.6	-19.7
			7308.0	-56.6	-19.8	7248.0	-56.5	-19.7
			9756.0	-56.2	-19.8			

Bandwidth (kHz), refers to the bandwidth of the measuring receiver

Limit according to FCC Part 15, Section 15.247(d):

In any 100 kHz bandwidth outside the frequency bands 2400 – 2483.50 MHz and 5725 – 5850 MHz, the digitally modulated radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or an radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required.

Frequency (MHz)	Spurious emission limit
Below 960	20 dB below the highest level of the desired power
Above 960	20 dB below the highest level of the desired power

The requirements are **FULFILLED**.

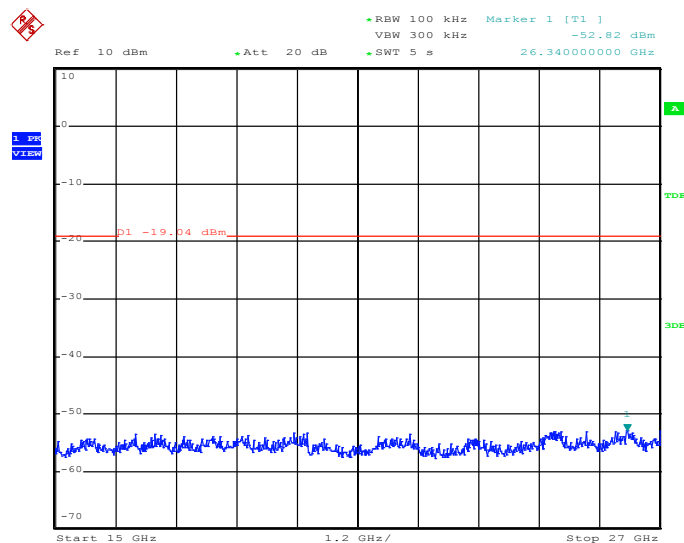
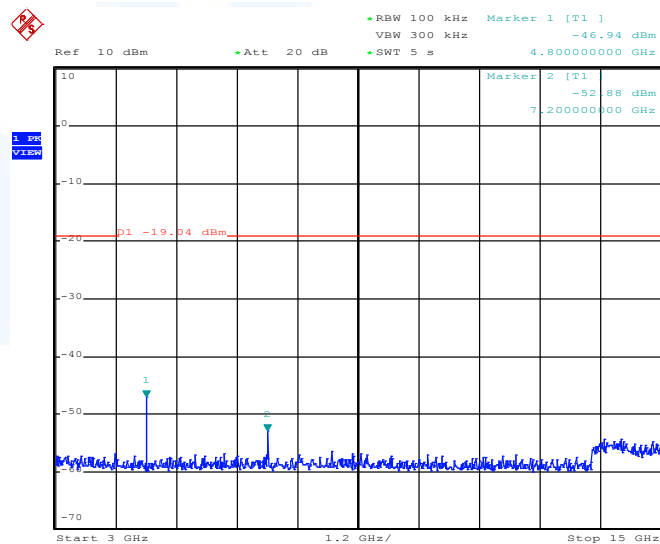
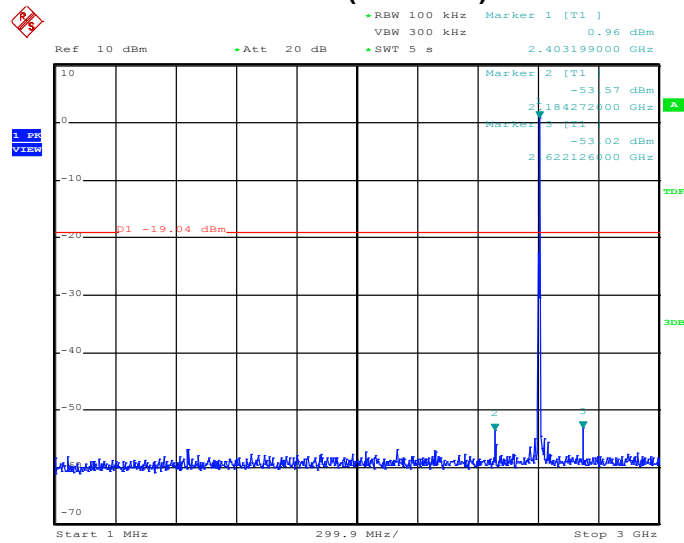
Remarks: The measurement is performed up to the tenth harmonic.

For detailed test results please refer to following test protocols.

FCC ID: T8GP104 IC ID: 6434A-P104

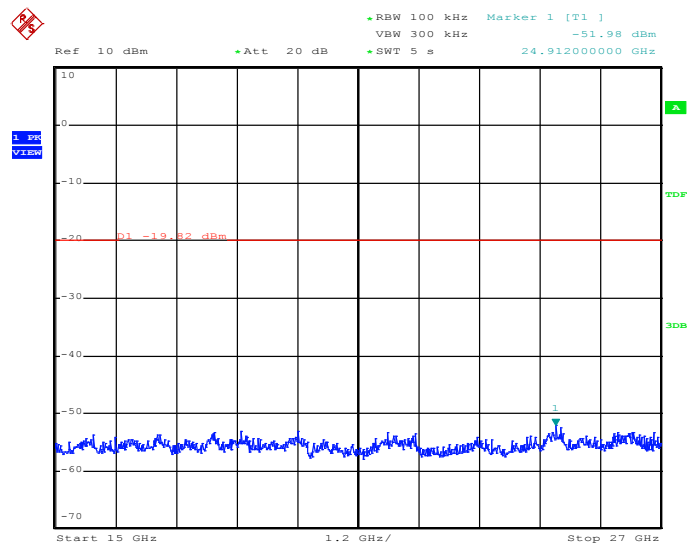
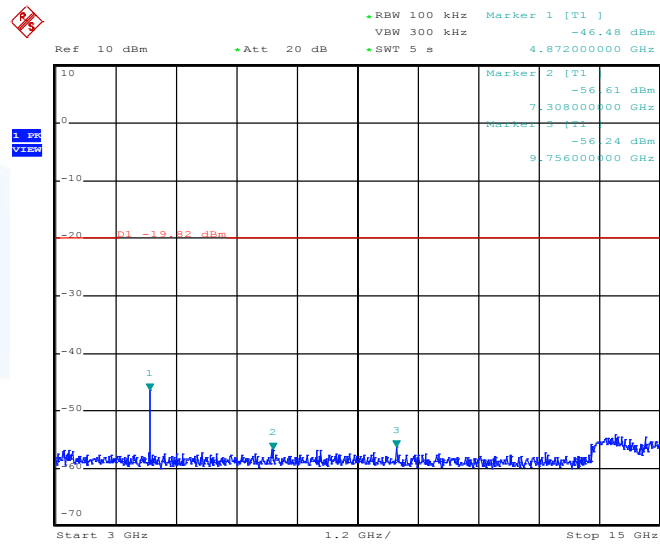
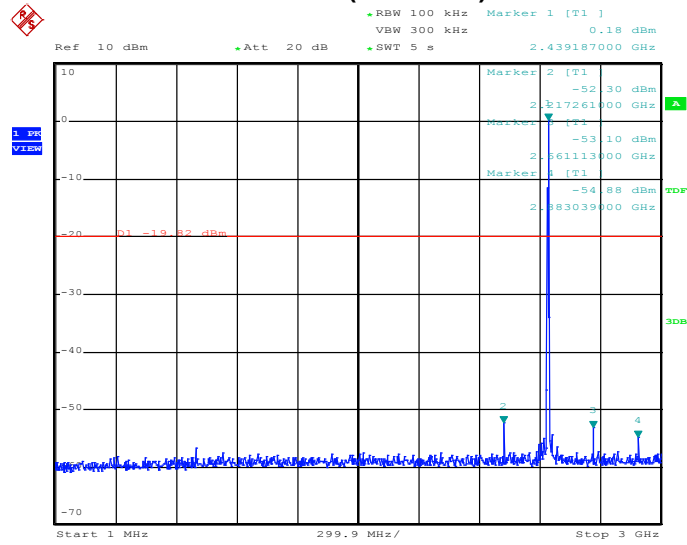
5.5.6 Test protocols

Channel 0 (2403 MHz)



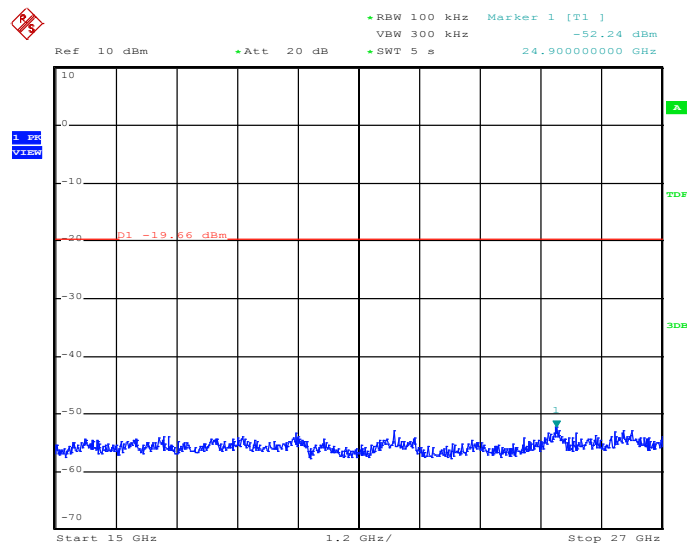
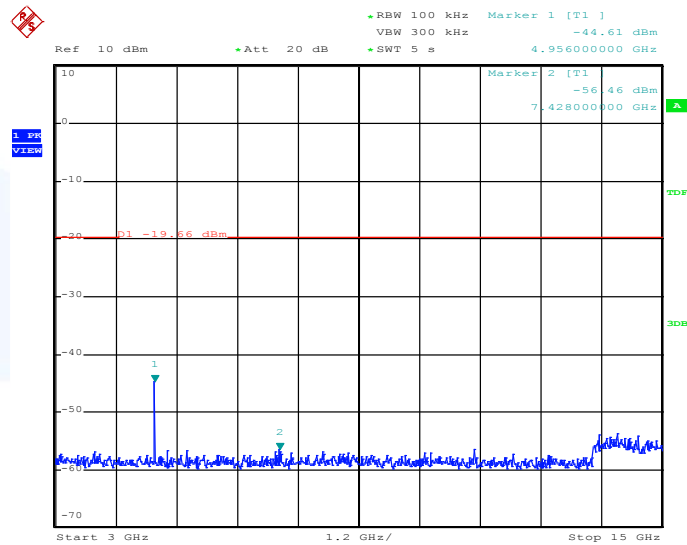
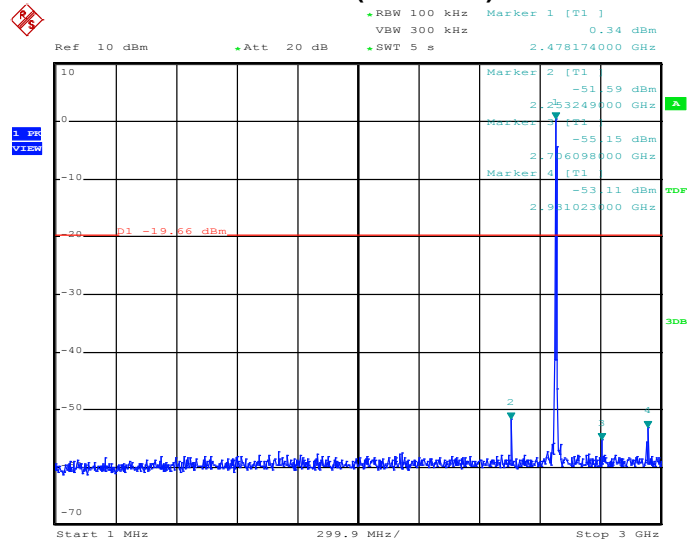
FCC ID: T8GP104 IC ID: 6434A-P104

Channel 7 (2438 MHz)



FCC ID: T8GP104 IC ID: 6434A-P104

Channel 15 (2478 MHz)



FCC ID: T8GP104 IC ID: 6434A-P104

5.6 Band edge compliance

For test instruments and accessories used see section 6 Part MB.

5.6.1 Description of the test location

Test location: Shielded Room S4

5.6.2 Photo documentation of the test set-up



5.6.3 Applicable standard

According to FCC Part 15C, Section 15.247(d):

In any 100 kHz bandwidth outside the frequency bands 2400 – 2483.5 MHz and 5725 – 5850 MHz, the digitally modulated radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or an radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required.

5.6.4 Description of Measurement

A spectrum analyser is connected to the output of the transmitter via a suitable attenuator while EUT was operating in transmit mode at the assigned frequency according Publication Number 913591, 03/26/2007.

Spectrum analyser settings:

RBW: 100 kHz, VBW: 300 kHz, Detector: Max peak, Trace Mode: Max hold, Sweep time: Auto

FCC ID: T8GP104 IC ID: 6434A-P104

5.6.5 Test result

f (MHz)	Delta level (dBc)	Limit (dBc)
Low Channel	-28.6	< -20
High Channel	-42.1	< -20

Peak-Limit according to FCC Subpart 15.247(d):

In any 100 kHz bandwidth outside the frequency band 2400 – 2483.5 MHz, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in §15.209(a) is not required.

In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limit specified in §15.209(a) (see §15.205(c)).

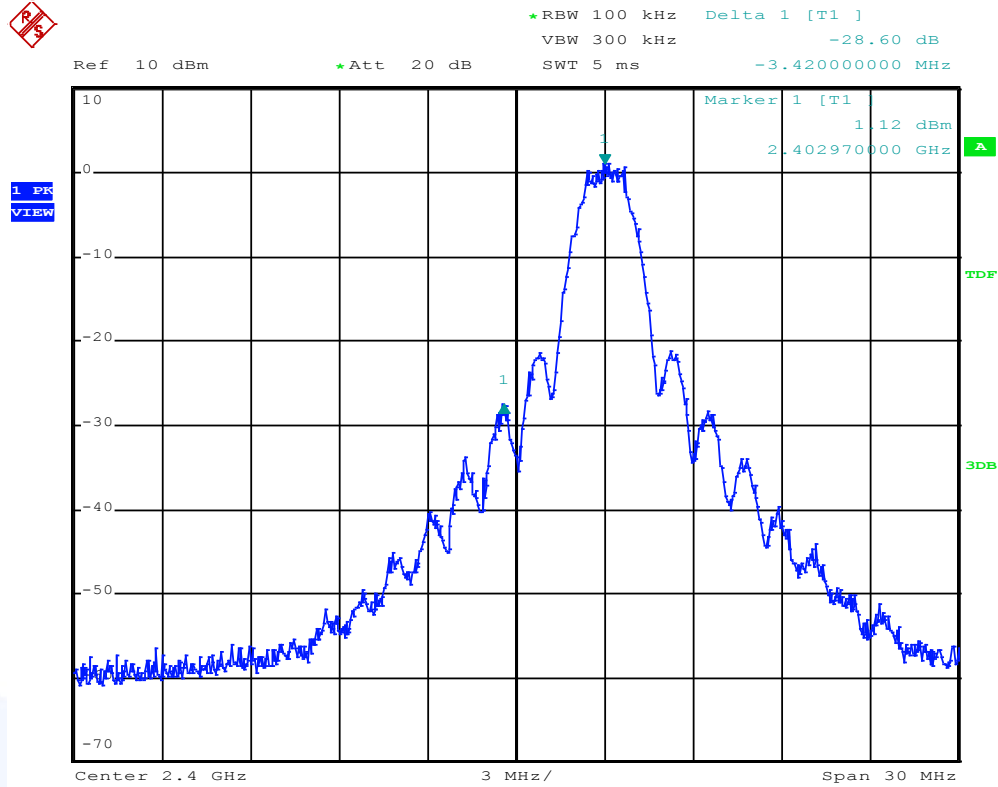
The requirements are **FULFILLED**.

Remarks: For detailed test results please refer to following test protocols.

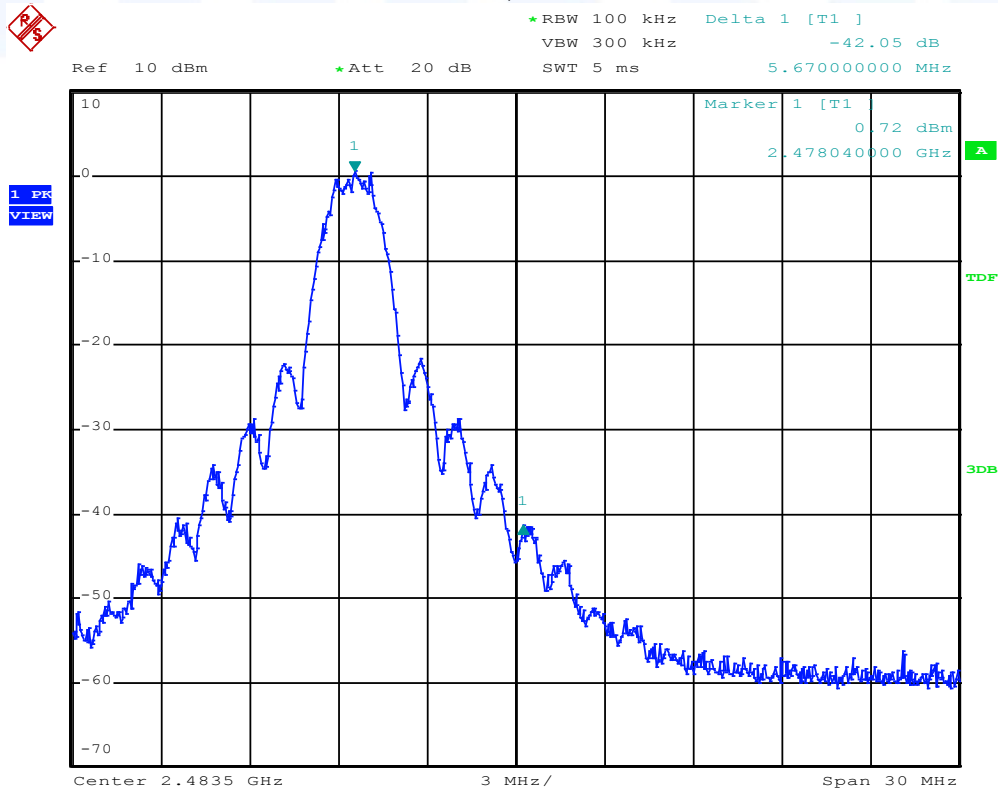
FCC ID: T8GP104 IC ID: 6434A-P104

5.6.6 Test protocol

Channel 0, 2403 MHz



Channel 15, 2478 MHz



FCC ID: T8GP104 IC ID: 6434A-P104

5.7 Radiated emissions in restricted bands

For test instruments and accessories used see section 6 Part SER 2, SER 3.

5.7.1 Description of the test location

Test location: OATS 1
Test location: Anechoic chamber 1
Test distance: 3 m

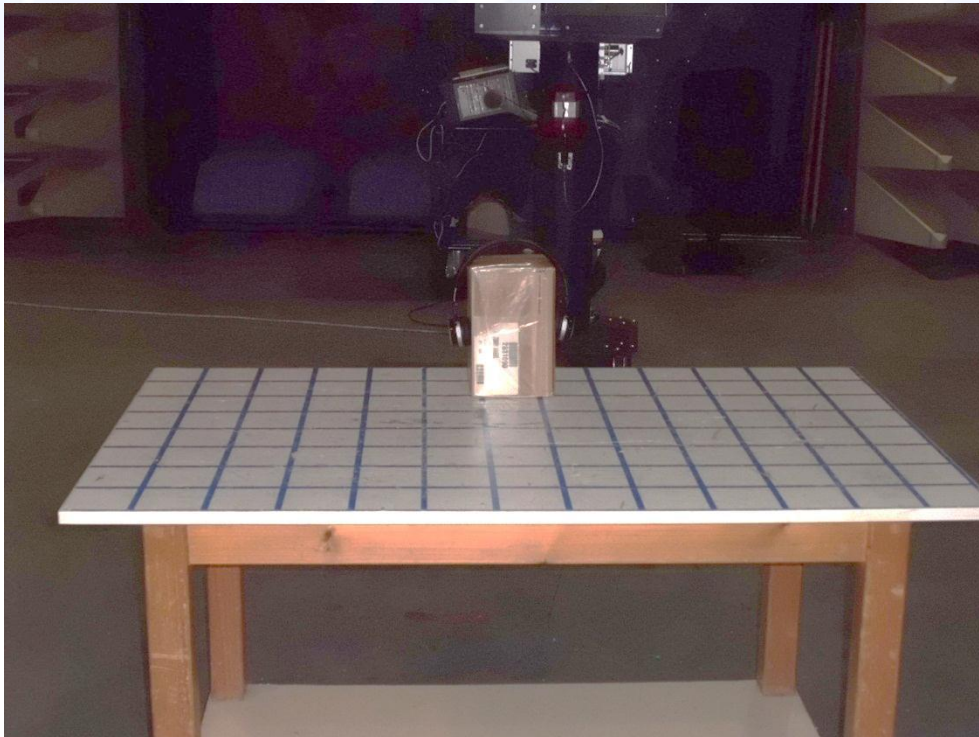
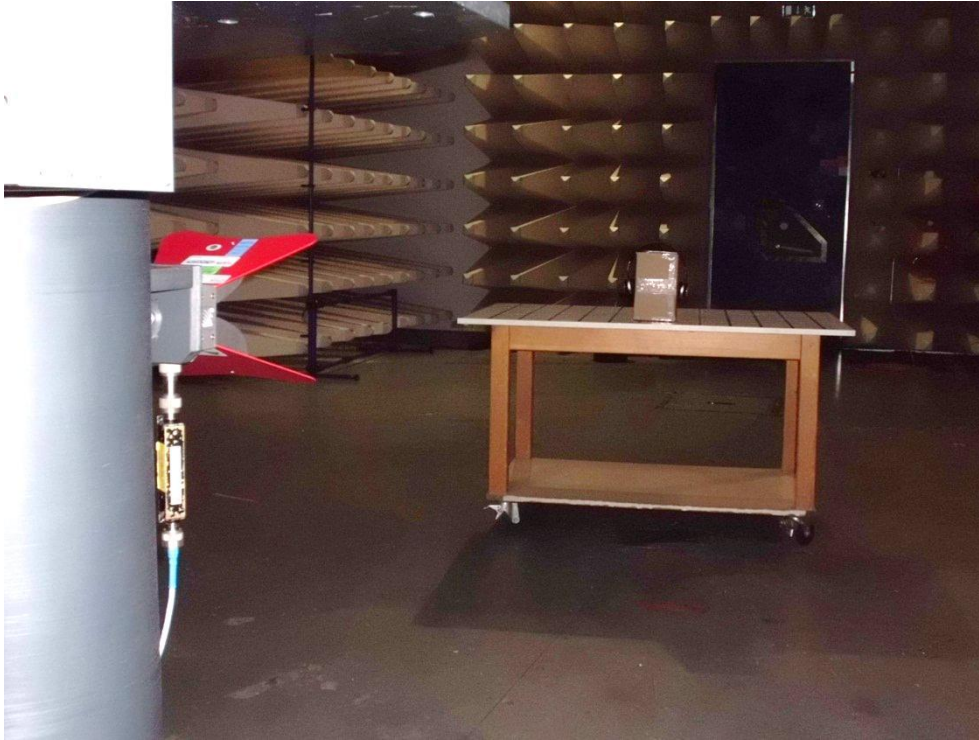
5.7.2 Photo documentation of the test set-up

Open area test site



FCC ID: T8GP104 IC ID: 6434A-P104

Anechoic chamber



According to FCC Part 15, Section 15.205(a):

In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limit specified in Section 15.209(a).

FCC ID: T8GP104 IC ID: 6434A-P104
5.7.3 Description of Measurement

The restricted bands are measured radiated. The span of the spectrum analyser is set wide enough to capture the restricted band and measure the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation. The restricted bands are measured falling emissions into it and the nearest restricted band are checked for emissions also the restricted band for the harmonics of the carrier.

Spectrum analyser settings:

RBW: 1 MHz,	VBW: 3 MHz,	Detector: Max peak,	Trace Mode: Max hold,	Sweep time: Auto
RBW: 1 MHz	VBW: 10 Hz	Detector: Max peak	Trace Mode: Max hold,	Sweep time: Auto

5.7.1 Test result

Restricted bands for Channel 0 (2403 MHz)

Frequency (MHz)	Peak		Average	
	Value dB(μV/m)	Limit dB(μV/m)	Value dB(μV/m)	Limit dB(μV/m)
2390.0*	50.0	74	37.1	54
4807.0	58.1	74	48.0	54

* Band edge measurement of restricted bands

Restricted bands for Channel 7 (2438 MHz)

Frequency (MHz)	Peak		Average	
	Value dB(μV/m)	Limit dB(μV/m)	Value dB(μV/m)	Limit dB(μV/m)
2216.1	48.1	74	-	54
4877.5	60.4	74	50.9	54
7315.6	50.3	74	-	54

Restricted bands for Channel 15 (2478 MHz)

Frequency (MHz)	Peak		Average	
	Value dB(μV/m)	Limit dB(μV/m)	Value dB(μV/m)	Limit dB(μV/m)
2251.4	50.3	74	-	54
2483.5*	64.0	74	49.7	54
2703.8	46.7	74	-	54
4953.9	63.7	74	53.2	54
7433.1	51.0	74	-	54

* Band edge measurement of restricted bands

Radiated limits according to FCC Part 15 Section 15.209(a) for spurious emissions which fall in restricted bands:

Frequency (MHz)	Field strength of spurious emissions		Measurement distance (metres)
	(μV/m)	dB(μV/m)	
0.009-0.490	2400/F (kHz)		300
0.490-1.705	24000/F (kHz)		30
1.705-30	30	29.5	30
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

FCC ID: T8GP104 IC ID: 6434A-P104
Restricted bands of operation:

The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209

MHz	MHz	MHz	GHz
0.090 – 0.110	16.42 – 16.423	399.9 – 410	4.5 – 5.15
0.495 – 0.505	16.69475 – 16.69525	608 – 614	5.35 – 5.46
2.1735 – 2.1905	16.80425 – 16.80475	960 – 1240	7.25 – 7.75
4.125 – 4.128	25.5 – 25.67	1300 – 1427	8.025 – 8.5
4.17725 – 4.17775	37.5 – 38.25	1435 – 1626.5	9.0 – 9.2
4.20725 – 4.20775	73 – 74.6	1645.5 – 1646.5	9.3 – 9.5
6.215 – 6.218	74.8 – 75.2	1660 – 1710	10.6 – 12.7
6.26775 – 6.26825	108 – 121.94	1718.8 – 1722.2	13.25 – 13.4
6.31175 – 6.31225	123 – 138	2200 – 2300	14.47 – 14.5
8.291 – 8.294	149.9 – 150.05	2310 – 2390	15.35 – 16.2
8.362 – 8.366	156.52475 – 156.52525	2483.5 – 2500	17.7 – 21.4
8.37625 – 8.38675	156.7 – 156.9	2690 – 2900	22.01 – 23.12
8.41425 – 8.41475	162.0125 – 167.17	3260 – 3267	23.6 – 24.0
12.29 – 12.293	167.72 – 173.2	3332 – 3339	31.2 – 31.8
12.51975 – 12.52025	240 – 285	3345.8 – 3358	36.43 – 36.5
12.57675 – 12.57725	322 – 335.4	3600 – 4400	Above 38.6

The requirements are **FULFILLED**.

Remarks: The measurement was performed up to the 10th harmonic. All emissions not reported in this test report are more than 20 dB below the specified limit.

FCC ID: T8GP104 IC ID: 6434A-P104

5.8 Power spectral density

For test instruments and accessories used see section 6 Part CPC 3.

5.8.1 Description of the test location

Test location: Shielded Room S4

5.8.2 Photo documentation of the test set-up



5.8.3 Applicable standard

According to FCC Part 15, Section 15.247(e):

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

5.8.4 Description of Measurement

The measurement is performed using the procedure set out in KDB-558074 clause 9. The power measurement was done using a spectrum analyzer, option 1. The cable loss of 1.3 dB @ 2.45 GHz is taken into account.

Spectrum analyser settings:

RBW: 3 kHz, VBW: 10 kHz, Detector: Max peak, Trace Mode: Max hold, Sweep time: Auto

FCC ID: T8GP104 IC ID: 6434A-P104

5.8.5 Test result

Channel	Fundamental frequency (MHz)	Total PSD (dBm/3 kHz)	Limit (dBm/3 kHz)
0	2403	-13.0	8
7	2438	-12.4	8
15	2478	-12.6	8

Power spectral density limit according to FCC Part 15, Section 15.247(e):

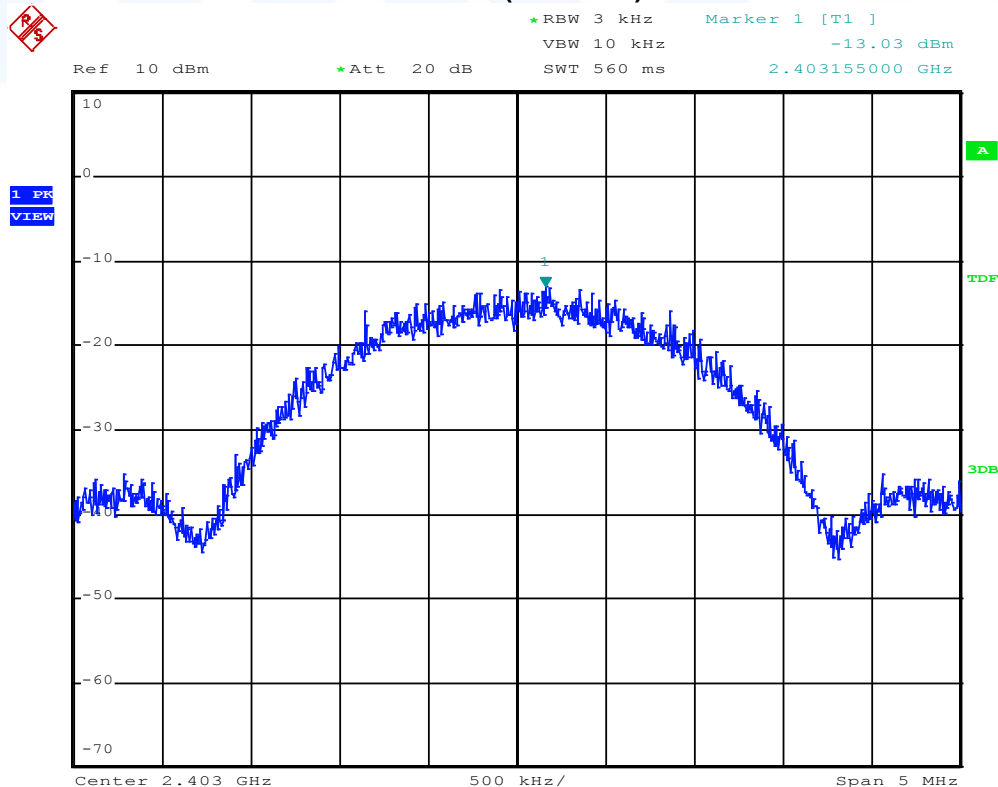
Frequency (MHz)	Power spectral density limit (dBm/3 kHz)
2400 - 2483.5	8

The requirements are **FULFILLED**.

Remarks: For detailed test results please refer to following test protocols.

5.8.6 Test protocols

Channel 0 (2403 MHz)



FCC ID: T8GP104 IC ID: 6434A-P104

Channel 7 (2438 MHz)

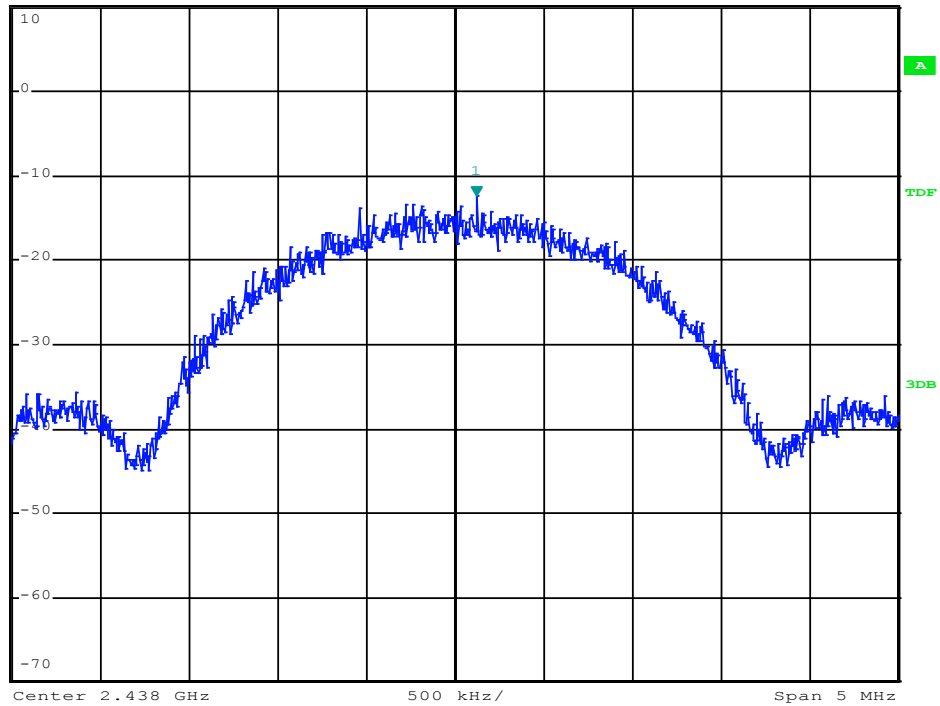


★RBW 3 kHz Marker 1 [T1]
VBW 10 kHz -12.40 dBm
SWT 560 ms 2.438115000 GHz

Ref 10 dBm

★Att 20 dB

1 PK
VIEW



Channel 15 (2478 MHz)

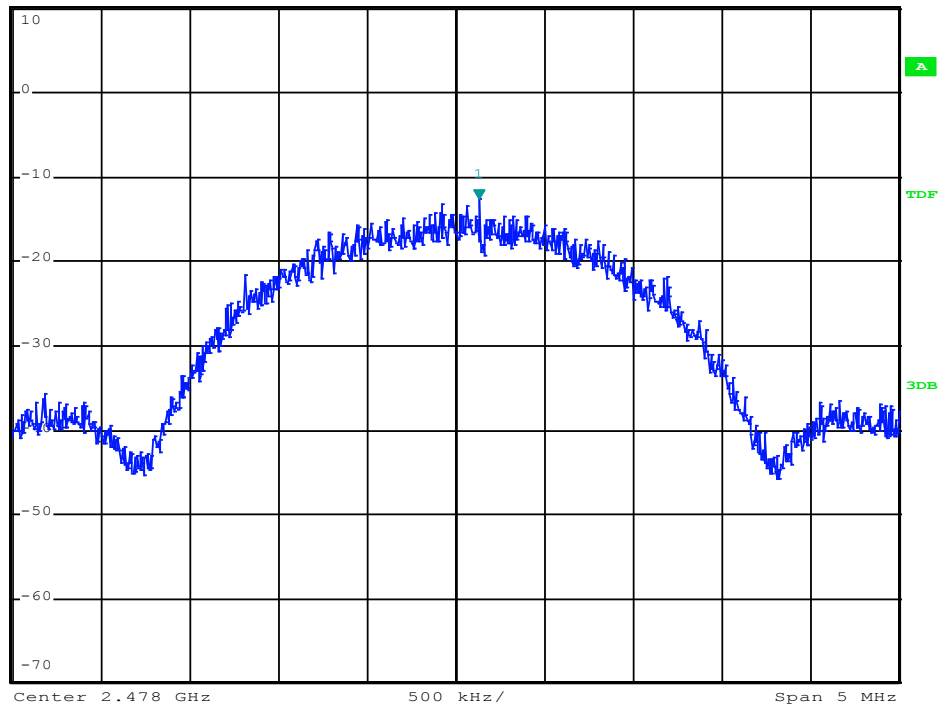


★RBW 3 kHz Marker 1 [T1]
VBW 10 kHz -12.64 dBm
SWT 560 ms 2.478125000 GHz

Ref 10 dBm

★Att 20 dB

1 PK
VIEW



FCC ID: T8GP104 IC ID: 6434A-P104

5.9 Standalone SAR test exclusion considerations

For test instruments and accessories used see section 6 Part **CPC 3**.

5.9.1 Description of the test location

Test location: NONE

5.9.2 Applicable standard

According to FCC Part 15, Section 15.247(i):

Systems operating under the provisions of this section shall be operated in a manner that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines.

The test methods used comply with ANSI/IEEE C95.1, "IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz".

This test report shows the compliance with the limits for Maximum Permissible Exposure (MPE) specified in FCC Part 1, Section 1.1310 and the criteria to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in FCC Part 1, Section 1.1307(b).

5.9.3 Description of Measurement

The maximum total power input to the antenna has been measured conducted as described in clause 5.4 of this document. The calculation is performed using the procedure set out in KDB-447498 clause 4.3.

Calculation:

$$\leq 3.0 = \frac{P_{out}}{r \times \sqrt{f_{GHz}}}$$

$$0.46 = \frac{7.2mW}{10mm \times \sqrt{2.403GHz}}$$

Where:

P_{out} = max. power of channel, including tune-up tolerance and antenna gain (mW)

r = min. test separation distance (mm)

f_{GHz} = is the RF channel transmit frequency (GHz)

The requirements are **FULFILLED**.

Remarks: The measurement and calculation is accd. OET Bulletin 65 not necessary.

Because that the device is worn next to the body, and the max. limit is ≤ 3.0 .

In that case no SAR test is required.

Pout was calculated of 4.1 dBm peak output power, 1.5 dBi antenna gain and +3 dB tune-up

toleranz. **Pout = 8.6 dBm = 7.2 mW.**

FCC ID: T8GP104 IC ID: 6434A-P104

5.10 Antenna application - Detailed photos see attachment A

5.10.1 Applicable standard

According to FCC Part 15C, Section 15.203:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit that broken antennas can be replaced by the user, but the use of a standard antenna jack is prohibited.

The EUT has an integrated antenna. No other antenna can be used with the device.

All supplied antennas meet the requirements of part 15.203 and 15.204.

5.10.2 Antenna requirements

According to FCC Part 15C, Section 15.247(b)(4):

The conducted output power limit specified in paragraph (b) of 15.247 is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from intentional radiator shall be reduced below the stated values in paragraph (b)(1), (b)(2) and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The output power has not to be reduced using the antenna type FR05-S1-N-0-102.

FCC ID: T8GP104 IC ID: 6434A-P104

5.11 Receiver AC power line conducted emissions

For test instruments and accessories used see section 6 Part A 4.

5.11.1 Description of the test location

Test location: NONE

Remarks: Not applicable. The device is battery powered

mikes

FCC ID: T8GP104 IC ID: 6434A-P104

5.12 Receiver radiated emissions

For test instruments and accessories used see section 6 Part **SER2** and **SER3**.

5.12.1 Description of the test location

Test location: OATS 1
Test location: Anechoic chamber 1

Test distance: 3 m

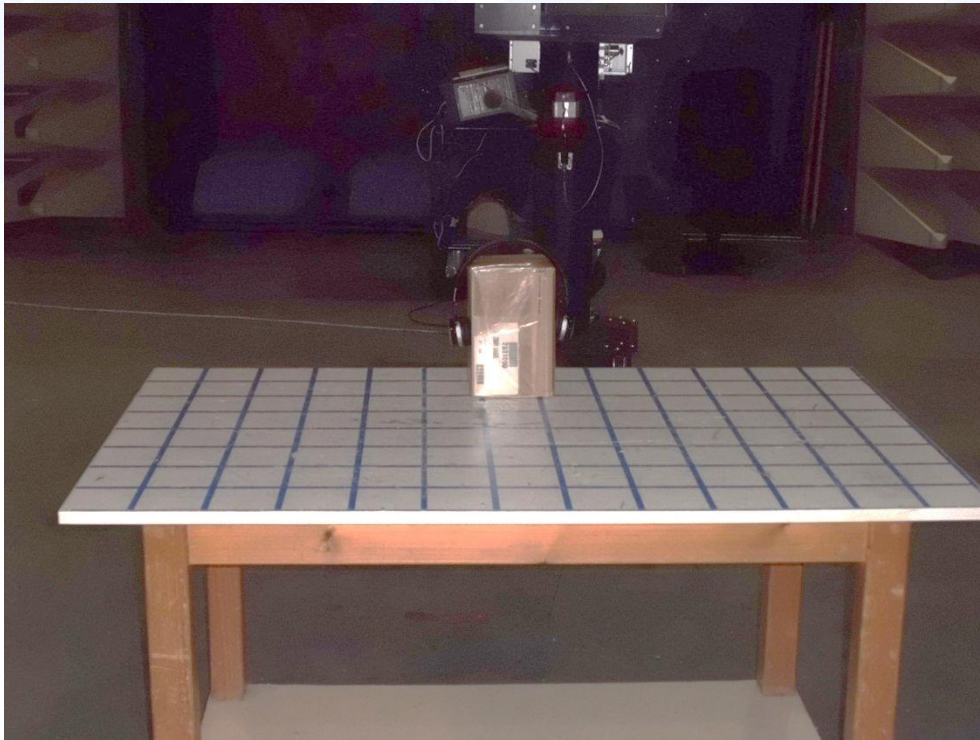
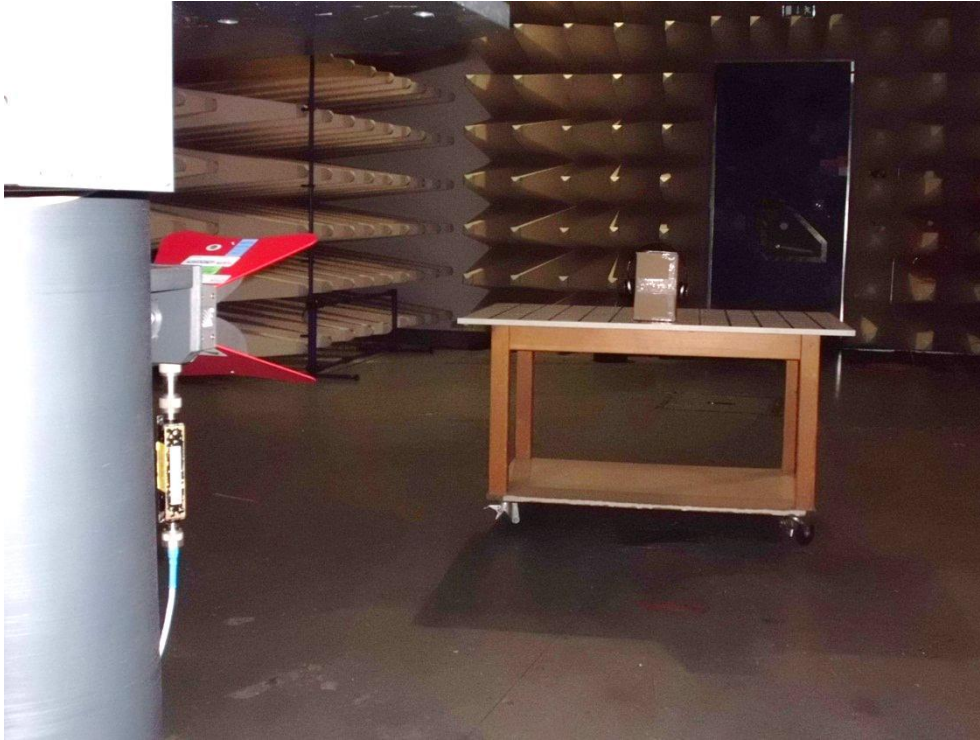
5.12.2 Photo documentation of the test set-up

Open area test site



FCC ID: T8GP104 IC ID: 6434A-P104

Anechoic chamber



FCC ID: T8GP104 IC ID: 6434A-P104
5.12.3 Applicable standard

According to RSS-Gen, Section 6:

Receivers shall comply with the limits of spurious emissions set out in this section, measured over the frequency range determined in accordance with Section 4.10.

5.12.4 Description of Measurement

Radiated emissions from the EUT in the range $f < 1$ GHz are measured under the circumstances described in point 4.4. In the frequency range of 1 GHz to maximum frequency as specified in section RSS Gen 4.10. For testing above 1 GHz, the emission level of the EUT in peak mode complies with the average limit then testing will be stopped and peak values of the EUT will be reported, otherwise, the emission will be measured again in average mode and reported.

Instrument settings:

30 MHz – 1000 MHz: RBW: 120 kHz
1000 MHz – 18000 MHz RBW: 1 MHz

5.12.5 Test result

$f < 1$ GHz:

Frequency (MHz)	Level QP (dB μ V)	Level AV (dB μ V)	Bandwidth (kHz)	Correct. factor (dB)	Level QP (dB μ V/m)	Level AV (dB μ V/m)	Limit (dB μ V/m)	Delta (dB)
30*	11.1	-	120	12.6	23.7	-	43.5	-19.8
150*	-0.5	-	120	14.0	13.5	-	43.5	-30.0
300*	2.3	-	120	16.3	18.6	-	46.0	-27.4
450*	1.1	-	120	20.3	21.4	-	46.0	-24.6
750*	-1.0	-	120	26.4	25.4	-	47.0	-21.6
1000*	-0.4	-	120	30.2	29.8	-	48.0	-18.2

*) Ambient noise

$f > 1$ GHz:

Frequency (MHz)	Level PK (dB μ V)	Level AV (dB μ V)	Bandwidth (kHz)	Correct. factor (dB)	Level PK (dB μ V/m)	Level AV (dB μ V/m)	Limit AV (dB μ V/m)	Delta (dB)
1000 *	47.0	-	1000	-15.1	31.9	-	54.0	-22.1
2000 *	48.4	-	1000	-12.0	36.4	-	54.0	-17.6
3000 *	47.0	-	1000	-9.5	37.5	-	54.0	-16.5
4000 *	37.9	-	1000	3.5	41.4	-	54.0	-12.6
5000 *	37.7	-	1000	3.8	41.5	-	54.0	-12.5

*) Ambient noise

FCC ID: T8GP104 IC ID: 6434A-P104

Limit according to RSS-Gen, Table 2:

Frequency (MHz)	Limit ($\mu\text{V/m}$)	Limit (dB $\mu\text{V/m}$)
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

The requirements are **FULFILLED**.

Remarks: During the test, the EUT was set into continuous receiving mode. The measurement was performed up to the 3rd harmonic (7500 MHz).

mikes

FCC ID: T8GP104 IC ID: 6434A-P104

6 USED TEST EQUIPMENT AND ACCESSORIES

All test instruments used are calibrated and verified regularly. The calibration history is available on request.

Test ID	Model Type	Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
CPC 3	FSP 40 Sucoflex N-1000-SMA	02-02/11-11-001 02-02/50-05-072	18/09/2013	18/09/2012		
MB	FSP 40 Sucoflex N-1000-SMA	02-02/11-11-001 02-02/50-05-072	18/09/2013	18/09/2012		
SEC 1-3	FSP 40 Sucoflex N-1000-SMA	02-02/11-11-001 02-02/50-05-072	18/09/2013	18/09/2012		
SER 2	ESVS 30 VULB 9168 S10162-B NW-2000-NB KK-EF393/U-16N-21N_20m	02-02/03-05-006 02-02/24-05-005 02-02/50-05-031 02-02/50-05-113 02-02/50-12-018	26/06/2013 16/03/2013	26/06/2012 16/03/2012	08/04/2013	08/10/2012
SER 3	FSP 30 AFS4-01000400-10-10P-4 AMF-4F-04001200-15-10P AFS5-12001800-18-10P-6 3117 Sucoflex N-1600-SMA Sucoflex N-2000-SMA	02-02/11-05-001 02-02/17-05-003 02-02/17-05-004 02-02/17-06-002 02-02/24-05-009 02-02/50-05-073 02-02/50-05-075	18/10/2013 18/12/2013	18/10/2012 18/12/2012		